

REMARKS

Claims 1-219, 230-234 and 236-311 are pending in the Application prior to the amendments herein.

Claims 1-219, 230-234 and 236-311 are rejected.

Claims 1, 78, 82, 84-88, 150, 152-158, 230, 240 and 241 are amended herein. Support for the amendments is in original claims 9, 81, 82, 151 and 239.

Claims 9, 81, 151 and 239 are cancelled.

Claims 1-8, 10-80, 82-150, 152-219, 230-234, 236-238 and 240-311 are pending after entry of the amendments herein.

1. Advisory Action

The Examiner issued an Advisory Action on January 18, 2007, indicating that the amendments proposed in the Applicant's Response to the Final Rejection, filed January 5, 2007, were not entered because, *inter alia*, they raised new issues that would require further consideration and/or search.

Applicant has filed herewith a Request for Continuing Examination and has addressed the Examiner's remarks given in the Advisory Action and the in the Final Office Action, issued October 23, 2006.

In the Advisory Action, the Examiner noted that "the claims 9, 81, etc. are product-by-process features that do not limit the catalyst per se. They are not cast as process steps." As the amendments to the claims were not entered in Applicant's Response to the Final Rejection, filed January 5, 2007, Applicant has amended the claims based on how they stood prior to the Final Office Action rather than from the amendments presented in the Applicant's reply of January 5, 2007.

2. Rejections Under 35 U.S.C. § 103(a) over Resasco

The Examiner has rejected Claims 1-16, 20-53, 230-234, 236-246 and 252-291 under 35 U.S.C. § 103(a) as unpatentable over Resasco et al., U.S. Patent 6,413,487 (“*Resasco*”). Final Office Action at 2.

The Examiner contends that “*Resasco* teaches [a] method for producing single-wall carbon nanotubes using a supported bi-metal metal catalyst of at least one metal from both group VIIIB and VIB. Iron, Co & Mo are all taught as catalytic metals on MgO (see claim 23). *Resasco* teaches the claimed ratios of metals, reducing the metal with hydrogen before contacting, and teaches contacting the catalyst with methane with hydrogen for a short period of time at the claimed temperatures to produce substantially pure single-wall nanotubes, then using HCl to remove the catalyst. While *Resasco* does not teach the same method of combusting precursors of the catalytic metals, the resulting product appears to be the same.” *Id.*

Applicant respectfully traverses the rejection. To establish a *prima facie* case of obviousness, at least three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference. Second, there must be a reasonable expectation of success. Finally, the prior art reference or references must teach or suggest all the claim limitations.

Claims 1 and 230 have been amended to require that, *inter alia*, the step of “combusting a foaming agent.” Claims 9 and 239 are hereby cancelled.

Combusting a foaming agent with the metal catalyst and support precursors is important in order “to increase the surface area of the resulting catalyst.” (See Application at page 11, lines

10-14.) The foaming agent is important in order to impart a high surface area to the catalyst, which also results in a low bulk density. See the Application at page 11, lines 22-23, which states “During combustion, the catalyst precursors rapidly foam and form a low bulk density, high surface area solid.”

Resasco does not teach, suggest or provide motivation for combusting any catalytic metal and support precursors with a foaming agent. With regard to amended Claim 1 specifically, *Resasco* does not teach, suggest or provide motivation for combusting a foaming agent and iron, molybdenum and magnesium oxide precursors in order to form a supported catalyst. With regard to amended Claim 230 specifically, *Resasco* does not teach, suggest or provide motivation for combusting a foaming agent, precursors of at least one or more catalytic metal selected from the group selected from Group VIII B metal precursors, Group VI B metal precursors, and combinations thereof, and refractory material precursors to form a supported catalyst. Thus, since *Resasco* does not teach, suggest or provide motivation for each and every element of amended Claims 1 and 230, Claims 1 and 230 are not *prima facie* obvious over *Resasco*.

Claims 2-8, 10-16 and 20-53 are directly or indirectly dependent upon amended Claim 1 and are not obvious over *Resasco* for the same reasons that amended Claim 1 is not obvious.

Claims 240-241, which depended from Claim 239, have been amended to depend from amended Claim 230.

Claims 231-234, 236-238, 240-246, and 252-291 are directly or indirectly dependent upon amended Claim 230 and are not obvious over *Resasco* for the same reasons that amended Claim 230 is not obvious.

Therefore, in light of the foregoing, Applicant respectfully requests that the Examiner withdraw his rejection of Claims 1-8, 10-16, 230-234, 236-238, 240-246 and 252-291 under 35 U.S.C. § 103(a) as obvious over *Resasco*.

3. Rejections Under 35 U.S.C. § 103(a) over Resasco in View of Smalley

The Examiner has rejected Claims 17-20, 78-125, 150-195 and 247-251 under 35 U.S.C. § 103(a) as being unpatentable over *Resasco* as applied above in view of Smalley et al., U.S. Patent 6,761,870 (“*Smalley*”). Final Office Action at 2.

Applicant respectfully traverses the rejections.

The Examiner contends that “*Resasco* does not teach sulfiding the catalyst. *Smalley* teaches a method of making single-wall carbon nanotubes using the same catalytic metals (bottom of column 3) as catalyst particles, but does not use a support. The nanotube growth step of *Smalley* is similar to that of *Resasco* in the use of temperature, feedstock, and resulting purity, among other analogous properties. *Smalley* teaches using thiophene and H₂S as sulfiding agents. It would have been obvious to one of ordinary skill in the art to use these agents in the process of *Resasco* in order to, as *Smalley* teaches, fine tune the activity of the catalyst (Column 13, first paragraph).” Final Office Action at 2-3.

Claims 17-20 are dependent upon amended Claim 1 which now requires, *inter alia*, the step of “combusting a foaming agent.” Neither *Resasco* nor *Smalley*, either alone or in combination, teaches, suggests or provides motivation for this element. Furthermore, even if the teachings of *Resasco* and *Smalley* were combined, they would not teach or suggest all the claim limitations. Thus, a case of *prima facie* obviousness has not been established as to Claims 17-20.

Claim 78 has been amended to require, *inter alia*, the step of “combusting a foaming agent with precursors of catalytic metal.” Neither *Resasco* nor *Smalley*, either alone or in combination, teaches, suggests or provides motivation for this element. Claim 81, which depended from Claim 78, is hereby cancelled. Claims 82 and 84-88, which depended from Claim 81, have been amended to depend from Claim 78.

Claims 79-80 and 82-125 are directly or indirectly dependent upon amended Claim 78 and are not obvious over *Resasco* in view of *Smalley*, for the same reasons that amended Claim 78 is not obvious.

Claim 150 has been amended to require, *inter alia*, the step of “combusting a foaming agent and precursors of cobalt oxide, molybdenum oxide and magnesium oxide.” Neither *Resasco* nor *Smalley*, either alone or in combination, teaches, suggests or provides motivation for this element. Claim 151, which depended from Claim 150, is hereby cancelled. Claims 152 and 154-158, which depended from Claim 151, have been amended to depend from Claim 150. Claim 153, which depended from Claim 152, has been amended to depend from Claim 150.

Claims 152-195 are directly or indirectly dependent upon amended Claim 150 and are not obvious over *Resasco* in view of *Smalley*, for the same reasons that amended Claim 150 is not obvious.

Claims 247-251 are dependent upon amended Claim 230 which now requires, *inter alia*, the step of “combusting a foaming agent.” Neither *Resasco* nor *Smalley*, either alone or in combination, teaches, suggests or provides motivation for this element. Furthermore, even if the teachings of *Resasco* and *Smalley* were combined, they would not teach or suggest all the claim limitations. Thus, a case of *prima facie* obviousness has not been established as to Claims 247-251.

Therefore, in light of the foregoing, Applicant respectfully requests that the Examiner withdraw his rejection of Claims 17-20, 78-80, 82-125, 150, 152-195 and 247-251 under 35 U.S.C. § 103(a) as being unpatentable over *Resasco* as applied above in view of *Smalley*.

4. Rejections Under 35 U.S.C. § 103(a) over Resasco and Smalley in View of Yamada

The Examiner has rejected Claims 54-77, 126-149, 196-219, and 292-311 under 35 U.S.C. § 103(a) as being unpatentable over *Resasco* et al. and *Smalley* et al. as applied above and further in view of Yamada et al. (U.S. Patent 5,102,647) (“*Yamada*”). Final Office Action at 3.

The Examiner contends that “Neither *Resasco* nor *Smalley* teach using fluidizing aid particles in the reactor. *Yamada* teaches a process for growing carbon fibers on catalyst particles while using ceramic particles as a fluidizing aid. *Yamada* teaches several ways of using the particles and teaches removing them separately and recycling them for reuse. *Yamada* also teaches using a counter-current flow method in the reactor. It would have been obvious to one of ordinary skill in the art at the time of the invention to use the ceramic particles in the processes of *Resasco* & *Smalley* in order to detangle the nanotubes and/or improve heat dispersion of the reaction as taught by *Yamada*, and to use counter-current flow to increase the interaction of the reactants and catalyst particles. The different variations of the claims are obvious variations that one of ordinary skill in reactor apparatus and fluidizing aid art would recognize as obvious and are not seen as patentably distinct.” *Id.*

Claims 54-77 are dependent upon amended Claim 1 which now requires, *inter alia*, the step of “combusting a foaming agent.” Neither *Resasco*, *Smalley*, nor *Yamada*, taken either alone or in combination, teaches, suggests or provides motivation for this element. Furthermore, even if the teachings of *Resasco*, *Smalley* and *Yamada* were combined, they would not teach or

suggest all the claim limitations. Thus, a case of *prima facie* obviousness has not been established as to Claims 54-77.

Claims 126-148 are dependent upon amended Claim 78 which now requires, *inter alia*, the step of “combusting a foaming agent with precursors of catalytic metal...” Neither *Resasco*, *Smalley*, nor *Yamada*, either alone or in combination, teaches, suggests or provides motivation for this element. Furthermore, even if the teachings of *Resasco*, *Smalley* and *Yamada* were combined, they still would not teach or suggest all the claim limitations. Thus, a case of *prima facie* obviousness has not been established as to Claims 126-148.

Claims 196-219 are dependent upon amended Claim 150 which now requires, *inter alia*, the step of “combusting a foaming agent and precursors of cobalt oxide, molybdenum oxide and magnesium oxide.” Neither *Resasco*, *Smalley*, nor *Yamada*, taken either alone or in combination, teaches, suggests or provides motivation for this element. Furthermore, even if the teachings of *Resasco*, *Smalley* and *Yamada* were combined, they would not teach or suggest all the claim limitations. Thus, a case of *prima facie* obviousness has not been established as to Claims 196-219.

Claims 292-311 are directly or indirectly dependent upon amended Claim 230 which has been amended to further require, *inter alia*, the step of “combusting a foaming agent...” Neither *Resasco*, *Smalley*, nor *Yamada*, taken either alone or in combination, teaches, suggests or provides motivation for this element. Furthermore, even if the teachings of *Resasco*, *Smalley* and *Yamada* were combined, they would not teach or suggest all the claim limitations. Thus, a case of *prima facie* obviousness has not been established as to Claims 292-311.

Therefore, Applicant respectfully requests that the Examiner withdraw his rejection of Claims 54-77, 126-149, 196-219 and 292-311 under 35 U.S.C. § 103(a) as being unpatentable over *Resasco* and *Smalley* as applied above and further in view of *Yamada*.

5. Conclusion

As a result of the foregoing, Applicant asserts that the Claims are now in condition for allowance.

The Examiner is invited to contact the undersigned attorney at (713) 934-4094 with any questions, comments or suggestions relating to the referenced patent application.

Respectfully submitted,

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